CLAIMS AS PREVIOUSLY PRESENTED

1. (Previously Presented) A method of measuring rotational and flight characteristics of a sphere, comprising the steps of:

photographing said sphere, at predetermined intervals, having a plurality of marks given to a surface thereof while said sphere is rotating to obtain a plurality of two-dimensional images of said sphere; generating an imaginary sphere, having a plurality of marks given to a surface thereof, formed at coordinates of a three-dimensional space of a computer screen; and setting an arbitrary posture of said imaginary sphere and an arbitrary position thereof as a reference posture and a reference position respectively;

deriving a relationship between three-dimensional coordinates and two-dimensional coordinates by using at least one photographing means;

converting positions of said marks given to said surface of said imaginary sphere formed at said coordinates in said three-dimensional space into positions on a two-dimensional image by using said relationship to find coordinate values of two-dimensional imaginary marks and find coordinate values of said marks present on said two-dimensional images of said sphere;

performing an operation of displacing a posture of said imaginary sphere relative to said reference posture and said reference position in such a way that said coordinate values of said two-dimensional imaginary marks and said coordinate values of said marks present on said two-dimensional images of said sphere are coincident with each other to specify a three-dimensional

posture of said sphere and a three-dimensional position thereof for each of said two-dimensional images of said sphere, according to an amount of said posture displacement operation; and

computing said rotational and flight characteristics of said sphere, according to said three-dimensional posture and position of said sphere specified for each of said two-dimensional images of said sphere at one time and said three-dimensional posture and position thereof at another time,

wherein said posture displacement operation comprises an operation of moving and rotating said imaginary sphere; and an amount of said posture displacement operation relative to said reference posture and said reference position is found by computations based on an optimization method called a genetic algorithm.

2. (Original) The method according to claim 1, wherein at least six three-dimensional coordinates are used in deriving said relationship between said three-dimensional coordinates and said two-dimensional coordinate.

3. (Original) The method according to claim 1, wherein as design six variables to be used in said posture displacement operation, three-dimensional positions of a center of gravity of said imaginary sphere and rotation angles thereof on rectangular coordinates consisting of an abscissa axis, an ordinate axis, and a vertical axis in a imaginary three-dimensional space.

4. (Cancelled)

5. (Original) The method according to claim 1, wherein a plurality of said marks are given to a surface of said imaginary sphere, with said marks symmetrical at not more than four times with respect to a rotational axis of said sphere in an operation of rotating said imaginary sphere.

6. (Previously Presented) An apparatus of measuring rotational and flight characteristics of a sphere, comprising:

a photographing means capable of photographing said sphere in various directions;

a recording means for recording two-dimensional images of said sphere obtained by said photographing means; and

a computing means for generating an imaginary sphere, similar to said sphere, at coordinates in a three-dimensional space and specifying a three-dimensional posture of said sphere and a three-dimensional position thereof, based on said imaginary sphere and said two-dimensional images of said sphere to find said rotational and flight characteristics of said sphere,

said computing means comprising a coordinate conversion program capable of deriving a relationship between three-dimensional coordinates and two-dimensional coordinates by using at least one photographing means; and

a posture recognition program for displacing a posture of said imaginary sphere in such a way that coordinate values of said marks present on said two-dimensional images of said sphere are coincident with coordinate values of two-dimensional imaginary marks found by converting positions of said marks given to a surface of said imaginary sphere formed at said coordinates in said three-dimensional space and specifying said three-dimensional posture of said sphere and a three-dimensional position thereof, according to an amount of said posture displacement operation relative to a reference posture of said imaginary sphere and a reference position thereof,

wherein said computing means has an optimization program for computing an amount of an operation of displacing said imaginary sphere relative to said reference posture and said reference position thereof, based on a genetic algorithm.

7. (Cancelled)

8. (Original) The apparatus according to claim 6, wherein said photographing means has a construction capable of photographing a sphere rotating or moving at a plurality of times at predetermined intervals.

9. (Previously Presented) A method of measuring rotational and flight characteristics of a sphere, comprising the steps of:

photographing said sphere, at predetermined intervals, having a plurality of marks given to a surface thereof while said sphere is rotating to obtain a plurality of two-dimensional images of said sphere; generating an imaginary sphere, having a plurality of marks given to a surface thereof, formed at coordinates of a three-dimensional space of a computer screen; and setting an arbitrary posture of said imaginary sphere and an arbitrary position thereof as a reference posture and a reference position respectively;

deriving a relationship between three-dimensional coordinates and two-dimensional coordinates by using at least one photographing means;

converting positions of said marks given to said surface of said imaginary sphere formed at said coordinates in said three-dimensional space into positions on a two-dimensional image by using said relationship to find coordinate values of two-dimensional imaginary marks and find coordinate values of said marks present on said two-dimensional images of said sphere;

performing an operation of displacing a posture of said imaginary sphere relative to said reference posture and said reference position in such a way that said coordinate values of said two-dimensional imaginary marks and said coordinate values of said marks present on said two-dimensional images of said sphere are coincident with each other to specify a three-dimensional posture of said sphere and a three-dimensional position thereof for each of said two-dimensional images of said sphere, according to an amount of said posture displacement operation; and

computing said rotational and flight characteristics of said sphere, according to said three-dimensional posture and position of said sphere specified for each of said two-

dimensional images of said sphere at one time and said three-dimensional posture and position thereof at another time,

wherein a plurality of said marks are given to a surface of said imaginary sphere, with said marks symmetrical at not more than four times with respect to a rotational axis of said sphere in an operation of rotating said imaginary sphere.